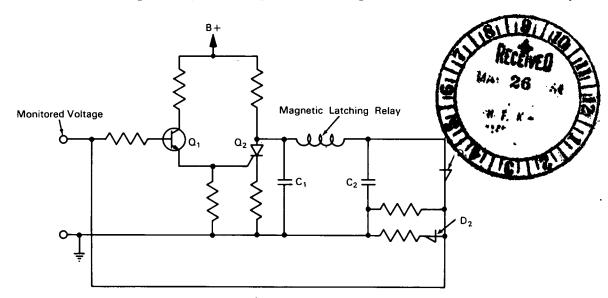
## NASA TECH BRIEF



This NASA Tech Brief is issued by the Technology Utilization Division to acquaint industry with the technical content of an innovation derived from the NASA space program.

## Circuit Switches Latching Relay in Response to Signals of Different Polarity



The problem: In order to cycle the armature of a single-coil magnetic latching relay between two opposite positions (i.e., between latch and unlatch) in response to a change in polarity of a monitoring signal, either of two methods has generally been used: one requires the use of two power supplies; the other requires a fixed reference level, which presents a stability program.

The solution: A circuit using only one power supply and two storage capacitors which can be separately discharged in opposite directions through the relay. A discharge path from one capacitor through the relay is switched by a silicon-controlled rectifier element. A discharge path from the second capacitor, which produces a current in the opposite direction through the relay, is switched by a pair of four-layer negative-resistance diodes.

How it's done: The B+ power supply places approximately equal charges on storage capacitors  $C_1$  and  $C_2$ . When the monitored voltage is positive, the silicon-controlled rectifier  $Q_2$  is triggered, and  $C_1$  is quickly discharged. As a result,  $C_2$  discharges through the relay, with a current flow from right to left. If the monitored voltage goes from positive to negative,  $Q_2$  becomes nonconductive and acts as an open switch, since an appropriate trigger voltage is not applied by transistor  $Q_1$ . The four-layer negative-resistance diodes  $D_1$  and  $D_2$  are then triggered to conduction, and  $C_2$  is quickly discharged. As a result,  $C_1$  discharges through the relay, with a current flow from left to right.

If the monitored voltage remains negative,  $D_1$  and  $D_2$  would continue to be conductive and the capacitors would remain discharged. If the monitored voltage

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tage subsequently goes from negative to positive,  $D_1$  and  $D_2$  become nonconductive, since they offer very high impedance in the reverse direction. Should the monitored voltage then remain positive,  $Q_2$  would remain conductive, and the capacitors would remain essentially discharged.

## Notes:

- 1. The circuit should be specially useful for driving components which are sensitive to current direction and which require greater power than is normally available at the output of a high-impedance source.
- 2. The circuit can be made quite sensitive by proper selection of components and introduction of gain stages at the input.

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